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Patients Factors and Medication Use Practices Affecting Blood Pressure Control Among Hypertensive Patients Attending a Secondary Health Facility in Ilorin, North Central Nigeria

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ABSTRACT

Background: The increase in the prevalence and economic burden of hypertension has been attributable to the poor knowledge of disease management and practices. The proper practices would enhance adequate control of blood pressure. This study aimed to determine patients' characteristics and medication use practices that influence their blood pressure control.

Methods: The study was conducted on 202 hypertensive patients attending a Civil Service Hospital, Ilorin, Nigeria. A validated interviewer-administered questionnaire was used for patients' data collection. The collected data were analyzed in SPSS v. 20. Descriptive statistics were used to analyze numerical and categorical variables, and the results are presented in text, percentages, and charts. The Chi-square and logistic regression tests were used as inferential analysis to determine the relationship between categorical variables. P values less than 0.05 were considered significant.

Results: The Mean±SD age of the patients was 59.1±13 years, with the highest frequency of hypertension occurring among patients aged 46-60 years (44.6%). Women were more affected (120; 69.4%) than men (82; 40.6%). The majority of the patients (132; 65.3%) were low- to moderate-income earners. Educational status, frequency of missed doses, and presence of comorbidity significantly influenced blood pressure control (P= 0.017, P= 0.039, and P= 0.019, respectively). Knowledge of the timely use of drugs and regular clinic visits significantly affected blood pressure control, too (P=0.014, and P=0.043, respectively). The blood pressure control among patients was fair despite the poor level of medication use knowledge/practices.

Conclusion: Blood pressure control is influenced by educational status and the presence of comorbid conditions. Timely medication use and regular clinic visits were strong predictors of blood pressure control. Multiple drug use was the most common hindrance to the timely use of medication.

Keywords: Determinants, Hypertension, Knowledge, Practice, Clinic visits

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Introduction

Hypertension is the most prevalent non-communicable disease. It is estimated that 45% of deaths among hypertensive patients are due to heart disease and 51% to stroke globally [1]. Several predisposing factors to hypertension vary considerably between countries and between different settlements (urban or rural) [2]. The higher prevalence of hypertension in the urban population may indicate differences in lifestyle, also as high as 46.5% of the population live in urban areas across African countries [3].

The health care services in Nigeria, as a developing country, have primarily focused on treating infectious diseases, such as malaria and tuberculosis. However, the increasing problems of non-communicable diseases such as hypertension in recent years have become a challenge to the health care system [4], with the African continent more affected than the rest of the world [4]. Nigeria is the most populous country amongst black nations globally and the most populated country in Africa, with about 200 million people of whom, 48% reside in the cities [5]. The increased risk of heart attack, stroke, heart failure, renal failure, and death have been attributed to long-standing hypertension among patients. The prevalence of hypertension in Nigeria is similar between men and women (7.9%-50.2% vs 3.5%-68.8%, respectively) and between the urban and rural settings (8.1%-42.0% vs 13.5%-46.4%, respectively) [6]. Fewer than 4% of Nigerians are covered by health insurance. These people include civil servants working for the federal government and women and children under the Maternal and Child Health Project [3]. One major problem affecting the response to this burden in Nigeria was that the awareness, treatment, and control of hypertension were low. Consequently, many hypertensive patients end up in health facilities with cardiovascular complications [7].

The important environmental factors affecting the health system are rural residence and the non-availability of healthcare facilities. Individual factors are poverty, low educational status, low spousal education, cost of drugs and healthcare, personal factors (psychosocial, health-related inertia), and drug-related issues. Therefore, to evaluate various social and economic factors considered barriers to hypertension treatment and control, we designed a qualitative study on rural women with hypertension referring to our hospital. A qualitative study to evaluate the obstacles and other determinants of hypertension awareness, treatment, and control among rural women attending the outpatient clinic was carried out at a medical college hospital in Jaipur, India [8].

Although there are several effective antihypertensive agents available for managing hypertension, patients with low socioeconomic status often have poor awareness and control of their high blood pressure [9, 10]. The patient's knowledge of hypertension also plays an essential role in the ability to achieve successful management. In addition, poor treatment adherence, inappropriate prescriptions, therapeutic inertia, and unhealthy lifestyle contribute to poor control [11]. Reminders that the patient uses could influence the level of adherence to medication use. An effective reminder method depends on other complex determinants of medication usage, such as medication type, patient population, or disease process [12]. More practical reminder-based interventions include blister-packs to measure dose usage, calendars, dose counters, and other special containers that enhance awareness of dose usage. Evidence also suggests that combination interventions confer greater efficacy than single-method approaches. Combining adherence-modifying strategies like reminders with other interventions produces a greater overall effect than any intervention alone [13, 14].

Taking medications incorrectly in terms of dose, frequency and timing could affect the therapeutic outcome. Such inconsistencies like missed doses and wrong timing are essential in achieving the optimal effect of antihypertensive medications [15]. Inappropriate dosing is one of the most common drug-related problems, especially in chronic diseases like hypertension [16].

Patients' educational status is a reliable socioeconomic index because it offers the most stable measure at an individual level and does not have the problem of reverse causation such as income and wealth status [17]. While patients adhere to their medication, there should be a measure of other factors apart from adherence that could interfere with the outcome of therapy, especially in the hypertensive condition, which requires chronic management. Hence, we need to comprehensively study inherent factors influencing blood pressure control in hypertensive patients.

Materials and Methods

Study site and sample size

This research was a cross-sectional study of hypertensive patients referring to Civil Service Hospital (CSH), located at Government Reservation Area, Ilorin, Nigeria.

CSH is a tertiary health facility with a patients turnover of about 200 per day. Non-specialized clinics are run throughout the week. Hypertensive patients are admitted along with other patients. The study was carried out between March and September 2019 on 202 hypertensive patients. The sample size was determined using the method described by Araoye (2006) [18]. Z, the standard normal deviate, usually is set at 1.96, which corresponds to the 95% confidence level. P is the proportion in the target population estimated to have a particular characteristic in the study area. The proportion of self-reported hypertension was found to be 11.5% [19] to 13.5% [6], so we used a higher value of 15.0% to ensure better capturing of the number of patients' clinic visits. With a 0.05 degree of precision (d), a sample size of 200 was obtained. Considering a 5% attrition rate, a total of 210 participants were recruited for the study.

The data collection was done using a standardized questionnaire which was designed and validated by the researcher. Face and content validation was done with the questionnaire by testing it among [20] patients at Sobi Specialist Hospital, a secondary health facility located in Ilorin. The Cronbach α was 0.75, indicating a good score and the validity of the instrument.

The questionnaire contained two sections where the first section was designed to obtain the sociodemographic data of the patients. Some patients' characteristics are used to determine their effects on some outcome variables like practices on medication use.

The second section contained question items related to patients' knowledge and practices in medication use and health-seeking behavior in a hypertensive disease condition. There were scoring criteria for some part of this section where the degree of patient-level of knowledge and practices was rated as (i) poor, (ii) fair, (iii) good, and (iv) excellent. Patients having ≥70% were considered with excellent knowledge/practice, from 60%-69% good, from 40%-59% fair, and less than 40% poor income level.

Income level was measured as low, moderate, or high. Those categories of patients who earn less than the national minimum wage were low, while those with moderate level earn between (Nigeria Naira ₦) 30000 and 70000. High-income earners were those who earn above ₦70000 per month.

The outcome of measurement was blood pressure control. Blood pressure control was assessed as recommended by Joint National Committee JNC 8, based on the blood pressure reading obtained. Blood pressure <140/90 mm Hg represented good (adequate) blood pressure control, while blood pressure ≥140/90 mm Hg represented poor blood pressure control. Blood pressure of < 150/90 mm Hg in patients aged 60 years and above represented good (adequate) blood pressure control while blood pressure ≥150/90 mm Hg represented poor pressure control [20].

Patients who did not have their blood pressure under control despite being on antihypertensive therapy were said to have poor control of their blood pressure.

Patients were selected on a consecutive basis, and a questionnaire was administered to each patient by the researcher (interviewer-administered method) after seeing their doctor. Patients were eligible for the study who were 18 years old or above and diagnosed with hypertension and placed on antihypertensive medicines for not less than one month since the study onset. Data obtained from this study were extracted on an Excel spreadsheet and transferred to SPSS version 20 for analysis.

Descriptive statistics were used to report patients' characteristics and examine the distribution of the variables in numbers and percentages. Pie chart and bar chart were also used to describe the distribution of non-ordered categorical variables to compare the variation in magnitude of each category. The Chi-square test and logistic regression were used to determine the association between categorical variables. P value less than 0.05 was considered significant.

Results

Out of 206 respondents who were interviewed, 202 questionnaires were found suitable for data analysis (response rate of 98.1%). The Mean±SD age of the samples was 43.5±6.4 years. The most occurring age group was 46-60 years, and most respondents were civil servants with a secondary level of education as the most occurring level of education achieved. Most respondents earned a moderate level of income (Table 1).

The patients' appropriate knowledge/practice of medication use and regular clinic visits are presented in Table 2. Patients with poor knowledge were more than any other categories, and the lowest score belonged to the patients with excellent knowledge /practice.

Gender difference in demographic characteristics of the patients was assessed, and results are presented in Table 3. Only two of the demographic characteristics of

Table 1. Demographic characteristics of the patients and blood pressure control

Variables	Groups	No.(%)
Age (y)	Less than 30	12(5.9)
	30-45	46(22.8)
	46-60	90(44.6)
	Above 60	54(26.7)
Gender	Male	82(40.6)
	Female	120(69.4)
Occupation	Self-employed	76(37.6)
	Civil servant	76(37.6)
	Retiree	30(14.9)
	Unemployed/dependant	20(9.9)
Level of education	Non-formal	36(17.8)
	Basic/primary	64(31.7)
	Secondary	72(35.6)
	Tertiary	30(14.9)
Income level (Nigeria Naira ₦)	Low (less than 30000)	32(15.8)
	Moderate 30-60 (30000-70000)	100(49.5)
	High (above 60 (> 70000)	70(34.7)
Comorbid condition	Present	42(20.8)
	Absent	160(79.2)
Blood pressure control	Adequate/ good control	89(44.1)
	Poor control	113(55.9)

the patients (age group and occupation) were significantly different from others.

A total of 20 patients (9.9%) had a comorbid condition with heart failure. Heart failure accounted for the highest morbidities with 6(2.97%), while diabetes accounted for 4(1.9%). Renal and asthma occurred among 3 patients (1.5%) each. The Chi-square analysis was performed on the presence of comorbidity of hypertension with other diseases against the level of missed doses. Deterrents to timely medication use among patients were presented in Figures 1 and 2. Multiple medication use accounted for the most frequently encountered obstacle (106, 52.5%), followed by non-interest and forgetfulness. Several methods used as reminders showed that a combination of methods was the most frequently used among patients (68, 33.7%), followed by the use of alarm/ ringer (56, 27.7%) (Figure 3).

Regarding the relationship between sociodemographic characteristics and blood pressure control in hypertensive patients, the following results were obtained (Table 4). Assessment of patient's knowledge or practice of appropriate use of antihypertensive medicines was carried out in four aspects: appropriate timing, dosage frequency, appropriate doses as recommended by the physicians, and regular clinic visits for follow-up. The following results were obtained (Table 5).

Table 2. Degree of knowledge/practice of the patients of hypertension management

Knowledge/Practice Characteristics	No.(%)			
	Poor	Fair	Good	Excellent
Knowledge of medication use at recommended time	46(22.8)	67(33.3)	70(34.7)	19(9.4)
Knowledge of medication use at appropriate frequency	96(47.5)	39(19.3)	26(12.9)	41(20.3)
Knowledge of medication use at recommended doses	18(8.9)	78(38.6)	80(39.6)	26(12.9)
Practice of regular clinic visits	96(47.5)	39(19.3)	26(12.9)	41(20.3)
Total score	250(31.2)	223(27.8)	202(25.2)	127(15.8)

Logistic regression analysis was also performed to determine the influence of education on blood pressure control with regular clinic visits as a cofounder. There was a significant relationship among those with a higher level of education who have good practices of regular clinic visits (P=0.014).

Discussion

Determining the patient's characteristics that affect the therapy outcome in hypertension is necessary to evaluate the essential factors in blood pressure control [21]. Patients' demographic characteristics like age, gender,

Table 3. Comparing demographic characteristics with gender difference among hypertensive patients

Patient's Characteristics	Variables	Gender/No.(%)			The Chi-square	P
		Male	Female	Total		
Age group (y)	Less than 30	4(33.3)	8(66.7)	12	8.194	0.046*
	30-45	26(56.5)	20(43.5)	46		
	46-60	36(40.0)	54(60.0)	90		
	Above 60	16(29.6)	38(70.4)	54		
Occupation	Self-employed	30(42.9)	40(57.1)	70	7.807	0.042*
	Civil servant	34(44.7)	42(55.3)	76		
	Retiree	6(20.0)	24(80.0)	30		
	Unemployed/dependent	6(30.0)	14(70.0)	20		
Level of education	Non-formal	12(33.3)	24(66.7)	36	3.878	0.275
	Primary/basic	28(42.4)	36(54.6)	64		
	Secondary	28(38.9)	44(61.1)	72		
	Tertiary	10(33.3)	20(66.7)	30		
Income	Low (less than NMW)	14(43.8)	18(56.2)	32	5.60	0.756
	Moderate	42(42.)	58(58.0)	100		
	High	26(37.1)	44(62.9)	70		
Presence of comorbidity	yes	22(52.4)	20(47.6)	42	3.05	0.08
	No	60(37.5)	100(62.5)	160		

NMW: National Minimum Wage; * Statistically significant at P<0.05.

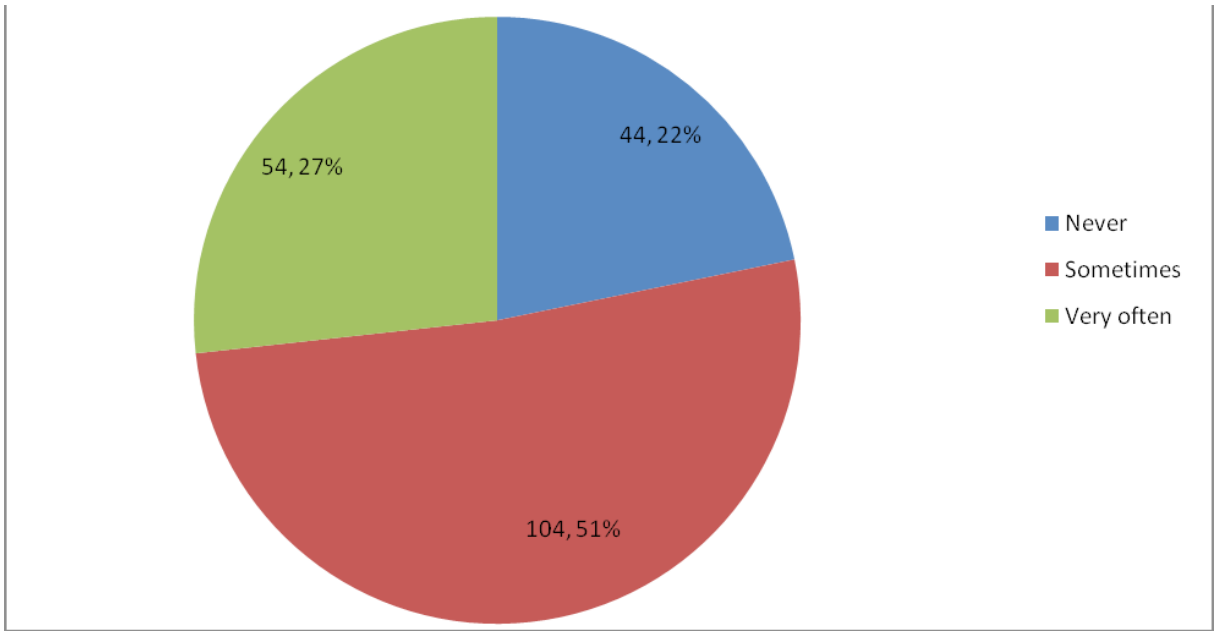

Figure 1. Frequency of Missed Doses Among Hypertensive Patients

occupational status, and level of education may play a role in medication use patterns. Knowledge about the disease and medication use practices like medication adherence and holding to clinic appointments might determine the clinical outcome of therapy in hypertensive patients [22]. The high occurrence of hypertension among the 46-60 year age group might probably result from their high level of clinic visits. However, the prevalence of hypertension is said to be high in people above 60 [23]. The practice of clinic visits was higher among women, similar to a report by Rhaman et al. [24]. This practice could be attributed to the gender distribution of the disease as blood pressure is more prevalent in women [25].

Most patients were in the working group who were mainly civil servants with the post-basic level of education. There was age and the occupational difference between genders. Male patients are more older and more in the unemployment group. Practice of regular clinic visits, appropriate frequency of use, and sourcing of medication were essential factors that influenced reasonable blood pressure control. Less than half of the patients had adequate (good) control of their blood pressure.

These results could reflect the prevalence of the disease in the community, with 40.6% among men compared to 69.4% among women [24]. This finding could

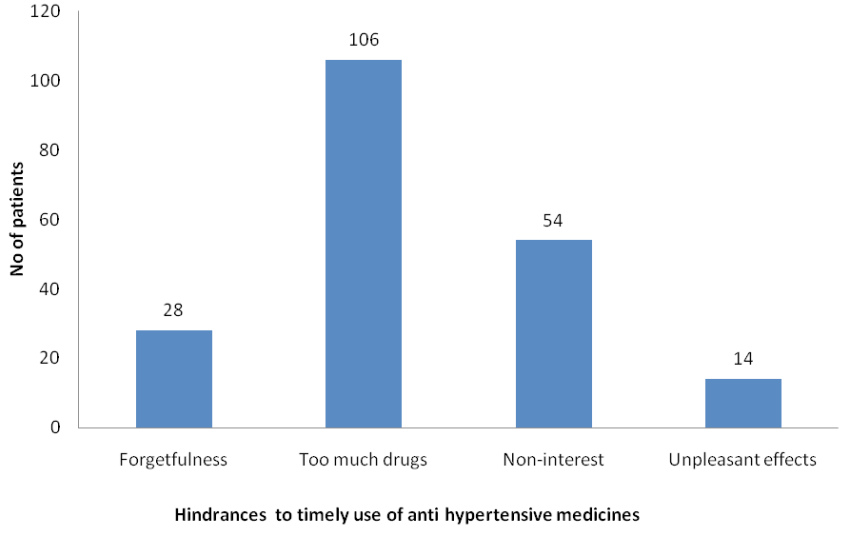

Figure 2. Hindrances to Patients' Adherence to Prescribed Medications

Table 4. Analysis of categorical variables to determine the effect of patients' characteristics on blood pressure control

Patient's Characteristics	Variables	Blood Pressure Control, No.(%)		Chi-square	P
		Adequate Control	Poor Control		
Age group (y)	Less than 30	5(41.7)	7(58.3)	9.47	0.814
	30-45	23(50.0)	23(50.0)		
	46-60	39(43.3)	51(56.7)		
	Above 60	22(40.7)	32(59.3)		
Gender	Male	37(45.1)	45(54.9)	0.63	0.801
	Female	52(43.3)	68(56.7)		
Occupation	Self-employed	33(43.4)	43(56.6)	1.738	0.629
	Civil servant	33(43.4)	43(56.6)		
	Retiree	16(53.3)	14(46.7)		
	Unemployed/ dependent	7(35.0)	13(65.0)		
Level of education	Non-formal	16(44.4)	20(55.6)	7.364	*0.017
	Primary/basic	28(38.9)	44(61.1)		
	Secondary	31(48.4)	33(51.6)		
	Tertiary	14(46.7)	16(53.3)		
Income (Nigerian Naira)	Low (less 30000*)	16(50.0)	16(50.0)	6.55	0.721
	Moderate (30000- 70000)	44(44.0)	56(50.0)		
	High > 70000	29(41.4)	41(58.6)		
Presence of comorbidity	yes	23(54.8)	19(45.2)	2.47	*0.019
	No	66(41.2)	94(58.8)		
Frequency of missed doses	Never	32(72.7)	12(27.3)	8.32	*0.039
	Sometimes	45(43.3)	59(56.7)		
	Always	22(40.7)	32(59.3)		

*NMW: National Minimum Wage: #30000 Naira per month; *Statistically significant at P<0.05.

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also reflect better awareness of hypertension among women than their male counterparts [26]. The patient's level of education, income, and presence of comorbidity was not significantly different between male and female patients. This finding implies that the financial, prior knowledge, other coexisting illnesses do not occur at a comparable difference among different sexes. The significant difference observed among the patient's occupational status was independently influenced by more patients who were civil servants compared to the unemployed/dependent patients.

In this study, heart failure was found to be coexisting with hypertension in up to 9.9% of patients, although it has been found that half of the heart failure cases are likely due to ischemic heart disease, and up to 10% of the cases could be due to the long-standing hypertension [27].

A high number of patients (as much as half) missed doses of antihypertensive drugs, indicating inappropriate adherence, and was found to be significantly affecting blood pressure control (P=0.039). The most frequently encountered obstacle to the timely taking of

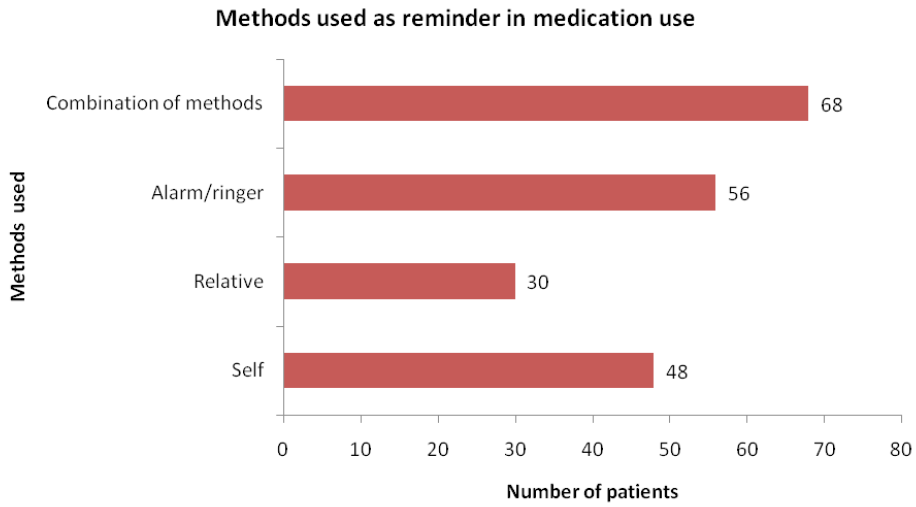

Figure 3. Methods used by the patients as reminders for antihypertensive medicines

medicine was multiple medications involved in treating hypertension. It is a fact that most hypertensive patients would require more than one drug to control their blood pressure effectively. Coupled with other coexisting health conditions requiring the use of medicines, there could be a low adherence level to medications. Multiple antihypertensive drugs and concomitant medications are associated with poor regular medication use in hypertensive patients [28].

Taking multiple medicines is a common practice in managing hypertension and sometimes more than one administration per day. For this reason, a reminder might be necessary to track appropriate timing for the medication use. The most effective method found in this study was a combination of different methods as a reminder. This course of action was followed by an alarm/ ringer, and the least was to entrust reminders to a third party. This finding agreed with the result found in a meta-analysis study to assess the most effective way of reminding in hypertensive patients. It was suggested that combined interventions confer greater efficacy than single-method approaches [29]. No single method is better than the other as patient medication use may be improved by a combination of reminder methods [30]. Strategies directed to enhancing medication-taking behavior should target the underlying barriers to appropriate medicine intake at the recommended dose and time. Reminders may therefore provide a valuable adjunct to adherence-enhancing strategies, particularly in populations for whom recurrent cues help assure correct medication use.

Many patients had poor knowledge (Table 2) compared with patients who had good and excellent knowledge of hypertension. Also, there was a significant relationship between the patient's level of education and blood pressure control. This could be as a result of

Table 5. Logistic regression analysis of factors influencing blood pressure control

Patient's Characteristics	B	S.E	Wald	df	P	Exp (B)	95% CI for EXP(B)	
							Lower	Upper
Knowledge/ practice of appropriate time of taking medicines	0.78	0.153	0.25	3	0.612	2.181	0.800	1.460
Knowledge of appropriate frequency for taking	-0.296	0.121	5.991	3	0.014*	0.744	0.587	0.943
Knowledge of appropriate dosing (no of tablets) of medicines	0.095	0.172	0.307	3	0.50	1.100	0.785	1.541
Practice of regular clinic visits	-0.296	0.121	5.991	3	0.014*	0.744	0.587	0.943
Practice of appropriate sourcing of medicines	-0.249	0.123	4.105	3	0.043*	0.780	0.613	0.992

*P-values less than or equal to 0.05 were considered significant.

patient education and counseling from the prescriber or and pharmacists, which were targeted at improving patients' understanding of medication use. A contrary view has been observed in a meta-analysis study of Zhang et al. (2016), where it was found that educational attainment does not modify the effect of educational interventions on blood pressure control compared to other environmental influences which have a profound impact on patients' attitudes to hypertensive management [31, 32].

The number of patients with adequate blood pressure control was far less than half (44%) which is below the recommended target by WHO of 50% control [33]. This finding is similar to a study on 23 African countries among 38 communities from 1993 to 2013 where blood pressure control did not exceed 45% [34].

Although inadequate financing affects the outcome on blood pressure control negatively [35], this study did not find a significant relationship between the income level of patients and blood pressure control. Possible factors could result from lack of distinct demarcation among different levels of income earnings as the majority of the patients were of low educational level (secondary school certificate) who could either be self-employed or civil servants with low-grade level. The combined effects of low socioeconomic status and poor adherence to antihypertensive medication are associated with increased mortality and cardiovascular disease risks, but patients with low income are more prone to non-adherence [36].

It could be seen that the presence of a comorbid condition could influence the ability of the patient to adhere to prescribed medication as there was a significant relationship between the two conditions. Patients with multiple diseases are likely to use multiple drugs, affecting their adherence level through the burden of medication, reduced interest, and even forgetfulness. Some patients may also experience unpleasant effects of some medicines, as could be experienced in some classes of antihypertensive drugs.

Patient knowledge and practice of appropriate frequency of medication use, regular clinic visits, and obtaining medication were essential in achieving adequate blood control (P=0.014, P=0.016, and P=0.043, respectively). Since the regular medication taking at prescribed doses would help control blood pressure, patients who could adhere to the appropriate schedule are likely to do better, as observed in this study, too. Regular clinic visits would ensure constant review of their medication which could, in turn, improve knowledge of the disease and medicine.

Educational status was not associated with blood pressure control in this study. However, one would expect that it could have influenced the understanding of the disease and medication use. A similar study carried out in Malta by Cuschieri et al. (2017) [17] could not find a relationship between educational status and hypertension. Besides, the level of education with regular clinic visits as confounder had a significant relationship on blood pressure control (P=0.014). On the contrary, Okai et al. [37] found that formal education and comorbidity would influence blood pressure control. In agreement with the findings of our study, they identified that high pill burden negatively affects the attainment of blood pressure control [37].

Conclusion

The blood pressure control among patients was at a fair level despite their poor level of medication use knowledge/practices. The degree of knowledge/practice of hypertension management was low. Blood pressure control was influenced by educational status and comorbid condition, timely use of medication, and regular clinic visits.

Ethical Considerations

Compliance with ethical guidelines

Approval of the study protocol was obtained from the Kwara State Ministry of Health.

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Authors contributions

Conceptualization and methodology: Jamiu M.O and Abdulganiyu Giwa; Halima Giwa and AdulAzeez: Data collection; Data analysis and script development: Jamiu.

Conflict of interest

The authors declared no conflict of interest.

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